

Analytical Proof of Concept for Integrating Bioassessment Results from Three State Probabilistic Monitoring Programs

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Background

The integration of biological indicator results from the probabilistic monitoring designs of three neighboring states serves as a demonstration for what could be achieved nationwide under future implementation of the State-EPA Wadeable Streams Assessment. The U.S. Environmental Protection Agency (U.S. EPA) has developed methods for an estimate of stream conditions using a nationwide probabilistic monitoring design. This design uses state data only to supplement the analysis of reference condition and not for the overall assessment of stream condition. The states chosen were West Virginia, Virginia, and Maryland. Complicating factors included that these states were/are in various degrees of program implementation, so some analytical support to at least one state was required. The study included the evaluation of the monitoring designs in the three states, the field and laboratory methods for benthic macroinvertebrates, and the analytical approach for developing reference conditions and assessment thresholds.

Requirements for Integrated Assessment of Stream Condition

- Probability-based designs
 - Design unbiased, supports estimates of precision
- Comparable sample frame (stream network)
- Surveys conducted during a similar time period
- Reliable field collection techniques and laboratory protocol, with QA/QC
- Comparable assessment endpoints (e.g. SCI)

Our Approach

- States treated as separate strata
- Reference criteria of VA and WV are applied to Maryland sites to identify common benchmark
- SCIs of VA and WV are applied to Maryland sites to determine stream condition
- Estimated proportion of streams in “poor” condition class for each state
- Combined estimates across states
 - Weighted results from each state by their portion of all stream miles

Stream Condition Index

Assessment Data by State

Maryland MBSS 2nd round, 2000-2004
1-4th order streams (596 sites, non-Coastal)

Virginia SCI scores, 2000-2003
1-6th order streams (820 sites, non-Coastal)

West Virginia SCI scores, 1997-2001
1-5th order streams (716 sites)

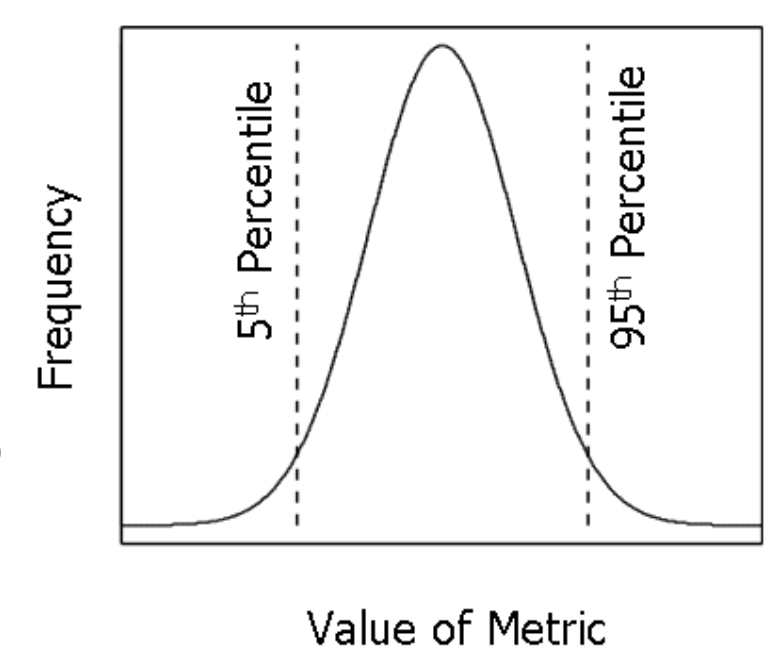
Surveys restricted to wadeable streams

How SCI is Calculated

All sites (not just reference) are used to determine range of metric scores

Metric scores are converted to 0-100 scale (WV worst is 0 and VA worst is 5th percentile, best is 95th percentile)

Mean of metric scores equals SCI score



Stream Condition Index (SCI) for WV and VA

Common Metrics:

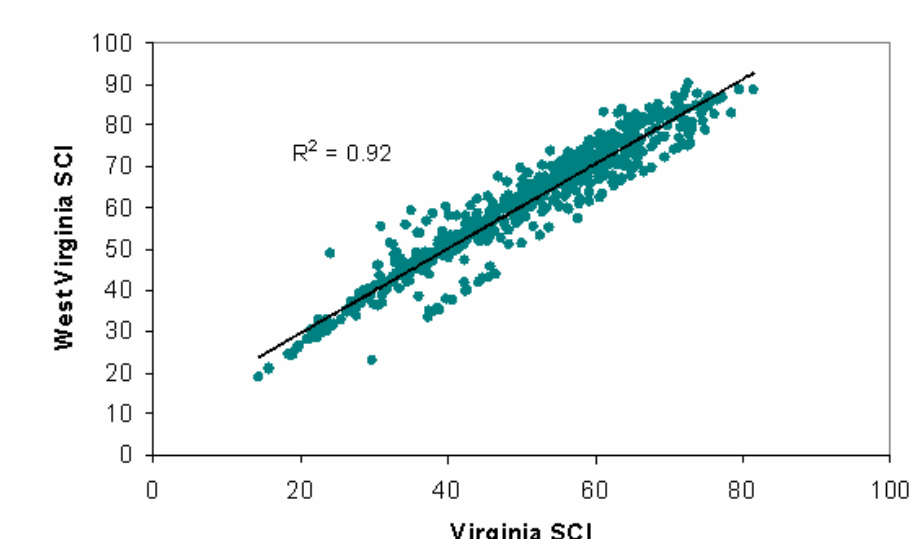
Total taxa
EPT index
% Chironomidae
% Top 2 dominant taxa
HBI

Metrics Specific to:

West Virginia:
% EPT

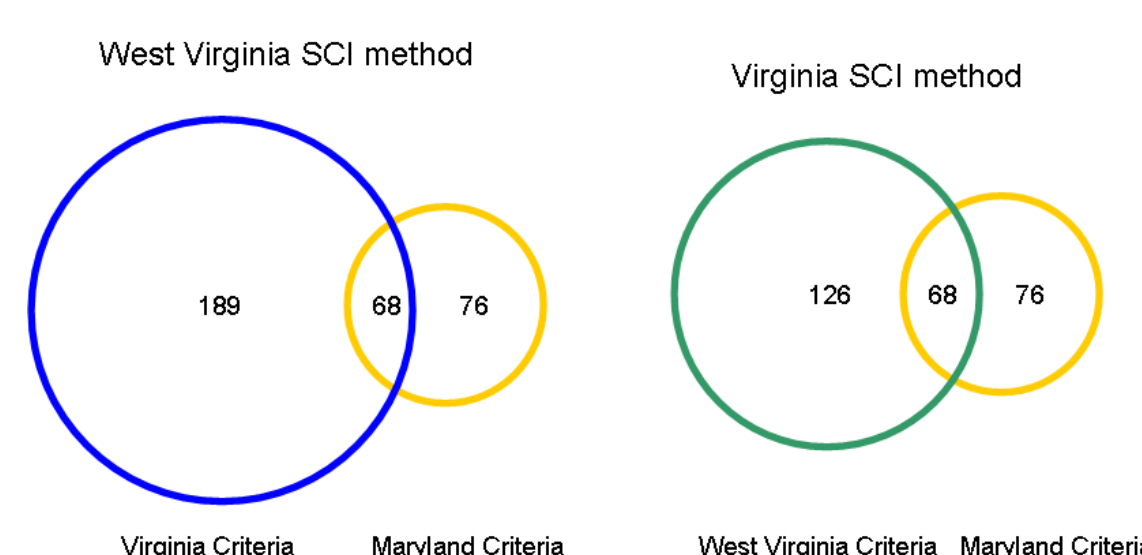
Virginia:
% Ephemeroptera
% Plec+Trich - Hydropsychidae
% Scrapers

WV and VA SCIs are comparable



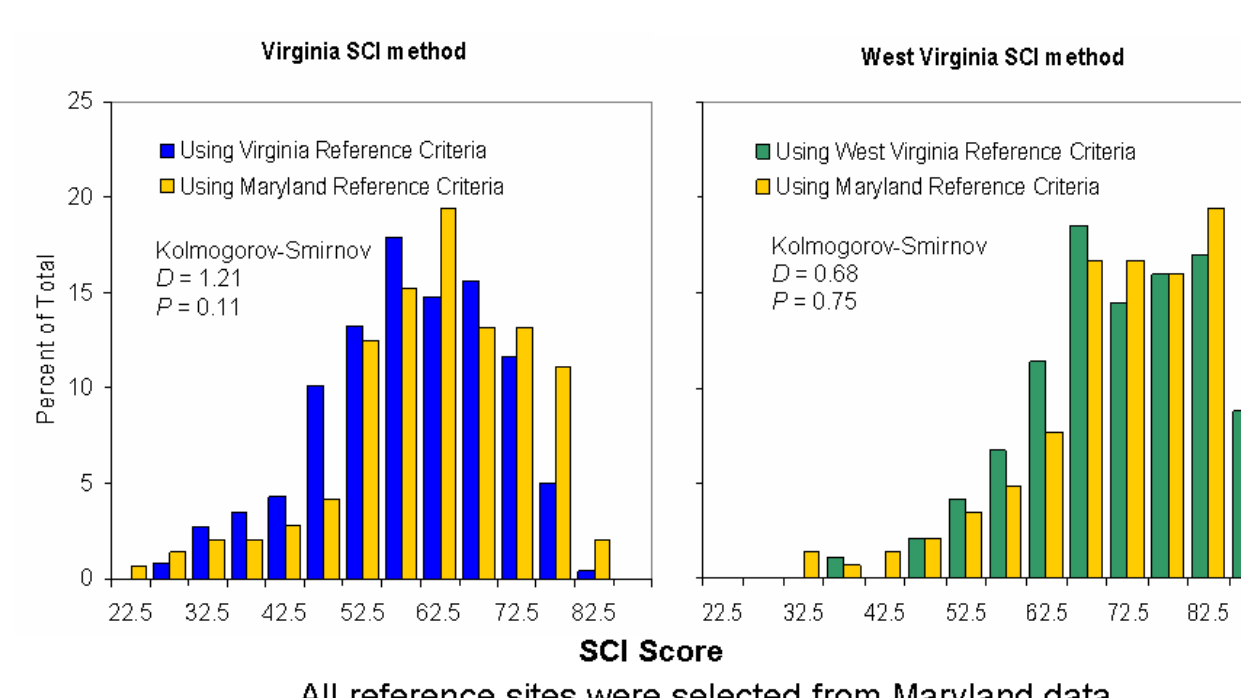
Reference Criteria

State Reference Criteria Select Different Reference Sites



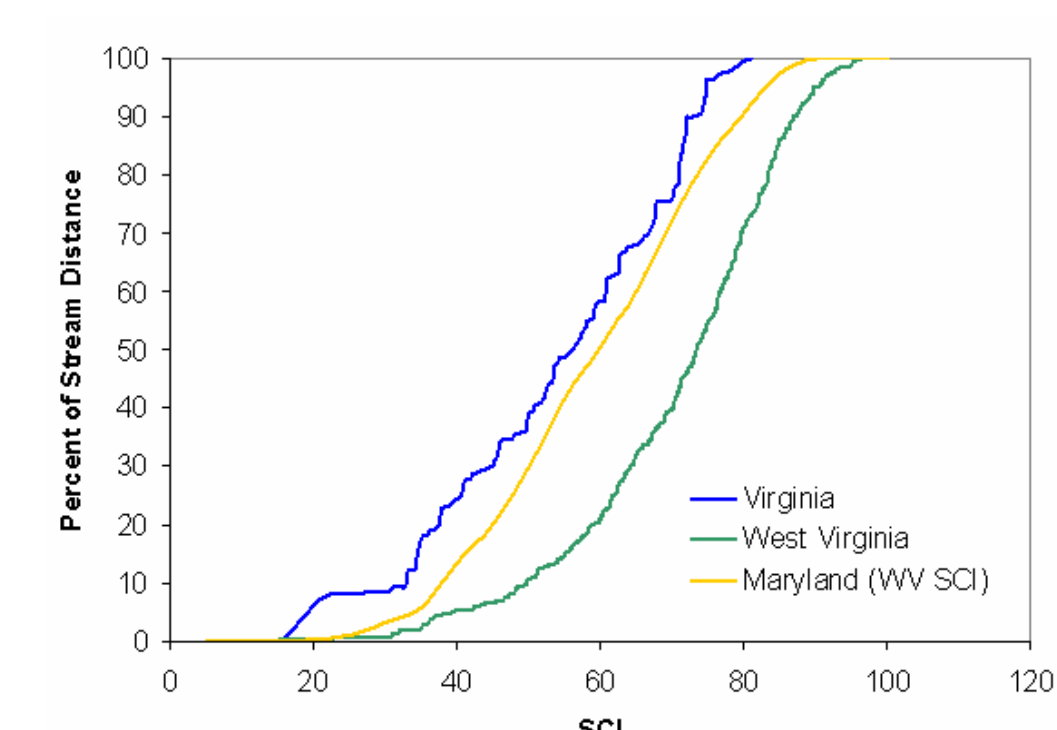
All reference sites were selected from Maryland data

Different Reference Criteria Produce Similar SCI Scores



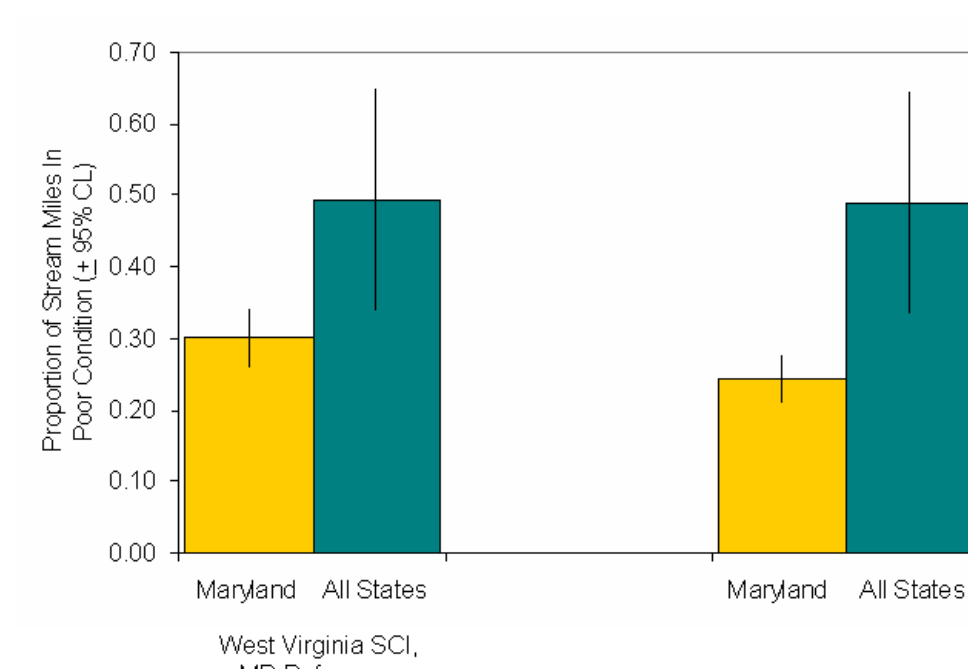
All reference sites were selected from Maryland data

Cumulative Distribution SCI at Reference Sites for Each State

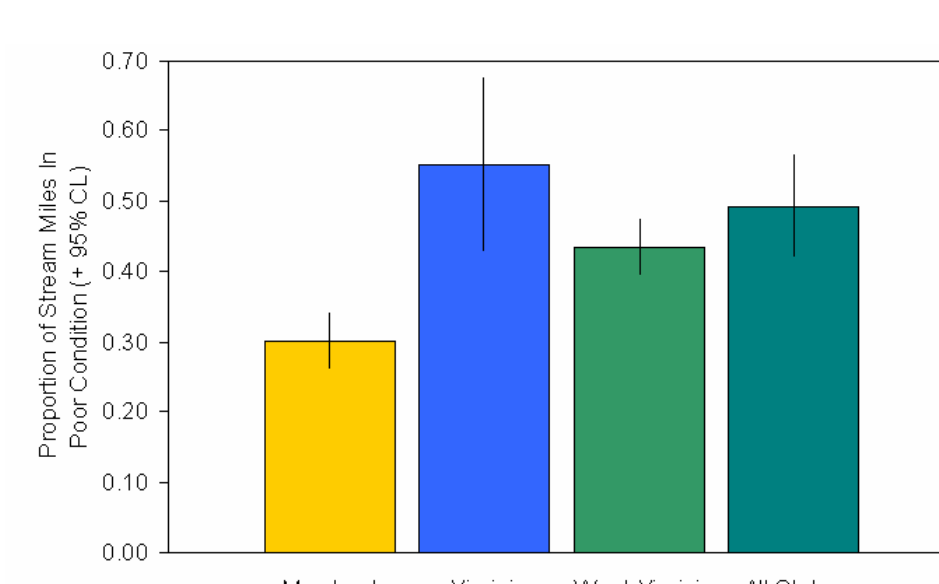


Preliminary Results

Proportion of Stream Miles in “Poor” Condition is Similar Across SCIs



Integrated Proportion of Stream Miles in “Poor” Condition



Conclusions

- State assessments can be combined if:
 - Survey designs are probability based
 - Common reference benchmark can be developed
- Application of different indices and reference criteria is permissible
- Differences found can lead to improvement in programs



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